1. A method for providing tactile force feedback in response to a user position and orientation, the method comprising the steps of:

storing data representative of a computer model, including one or more objects having surfaces;

generating an electrical signal for each of a plurality of degrees of freedom of the user as a function of the user position and orientation;

synthesizing user velocity and acceleration from the electrical signals to determine user-applied force;

mapping the user position, orientation and applied force with respect to computer model to determine interactions between the user and any objects included in the model;

generating at least one force field in response to the interactions;

generating a force signal for each degree of freedom as a function of the force field; and

directing a tactile force on the user for each force signal, the generated tactile forces providing the tactile feedback.

2. The method of claim 1 wherein the number of degrees of freedom is two or more.

3. The method of claim 2 wherein the step of generating the electrical signals includes the step of sensing position and orientation of the user's hand and wherein the tactile forces are directed to the user's hand.

4. The method of claim 1, wherein the step of synthesizing user velocity and acceleration from the electrical signals to determine user-applied force includes the step of sampling the electrical signals at regular intervals to synthesize estimates of user velocity and acceleration.

5. The method of claim 1, further including the step of computing a torque contribution associated with each degree of freedom based upon user position, orientation and applied force to assist in determining the interaction between the user and any objects of the model.

6. The method of claim 5, further including the step of applying the torque contributions to a running sum of such contributions.

7. The method of claim 1, further including the step of generating an altered force field view by performing a mathematical transformation on the position and orientation data.

8. A system for providing tactile force feedback in response to a user position and orientation, the system comprising:

a multi-axis interface device including an actuator for each axis and a member movable by the user, the interface device being responsive to the position and orientation of the member to generate electrical signals representative of the position and orientation of the

member; and

a programmed computer operative to:

store data representative of a computer model, including any objects associated therewith,

analyze the position and orientation of the member relative to the objects to determine any interaction therebetween,

generate at least one force field in response to the interaction, and

generate a force signal for each axis of the device as a function of the force field, wherein the actuators are responsive to their respective force signals to provide a force to each axis of the device for creating the force feedback.

9. The system of claim 8 wherein the computer model is associated with computer-aided design.

10. The system of claim 8 wherein the member includes a handle gripable by the user.

11. The system of claim 8 wherein the virtual reality force field includes limits and stops implemented by the computer program.

12. The system of claim 11, including a force limit based upon velocity.

13. The system of claim 11, including a power limit based upon the integral of average power consumption

with respect to time.

14. The system of claim 8 wherein the means for generating is capable of generating a plurality of force fields, and wherein the member includes a switch means for selecting one of the force fields.

15. A locally self-contained system for providing tactile feedback in response to a user position and orientation, comprising:

(a) a multi-axis, user-moveable member including an actuator and position sensor dedicated to each axis;

(b) an interface device in communication with each actuator and each position sensor, the interface device being operative to:

generate an electrical signal representative of the position and orientation of the member, and

activate one or more of the actuators in response to a received force signal;

(c) a programmed computer in communication with the interface device, the computer being programmed to perform the following functions:

receive an electrical signal from the interface device representative of the position and orientation of the member with respect to time,

determine a user-applied force to the member by synthesizing velocity and acceleration from the periodic position readings,

generate at least one virtual reality force field in response to the user-applied force,

generate a force signal as a function of the force field, and

output the force signal to the interface device.

16. The locally self-contained system of claim 15, wherein the actuator and position sensor associated with a particular axis are in physical communication with one another, enabling the superposition of translational displacement with force application, and angular displacement with torque, thereby permitting an arbitrary, programmed application of forces, torques and displacements to the member in any direction.

17. The method of balancing the power consumption of a manipulator having a peak torque mode and an average power rating in a tactile-feedback environment, comprising the steps of:

operating the manipulator primarily in the peak torque mode;

at least periodically integrating the average power consumed by the manipulator as a function of time; and

backing off from the peak torque mode, at least momentarily, in the event the average power rating of the manipulator has been exceeded.

18. The method of claim 17, including the step of continuously integrating the average power consumed by the manipulator as a function of time.